Lifetime and Recent Prostate Specific Antigen (PSA) Screening of Men for Prostate Cancer in Canada

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ABSTRACT

Background: In spite of national guidelines which do not recommend prostate specific antigen (PSA) screening for prostate cancer or are inconclusive, Canadian men may be accessing the screening test.

Methods: For the purpose of informing prostate screening policy, cross-sectional self-reported data from the *Canadian Community Health Survey* (2000-2001) were analyzed to determine the lifetime and recent PSA screening prevalence of Canadian men aged 50 and older with no prostate cancer, and to explore the socio-demographic characteristics associated with ever being screened. Multivariate binomial regression analyses were used to calculate prevalence rate ratios as a measure of association between respondents' characteristics and PSA screening behaviour.

Results: Almost half of Canadian men over the age of 50 years (47.5%; 95% CI=46.4-48.5) reported receiving PSA screening during their lifetime. Seventy-two percent (71.8%) of PSA screening was performed within one year prior to the survey or recently. Lifetime prevalence was highest among men aged 60-69 (53.1%; 95% CI=51.1-55.1). Next to advanced age, having a family doctor was the most predictive of screening behaviour (PRR=1.83, $p \leq 0.01$). Black ethnicity, a risk factor for prostate cancer, failed to be predictive of screening (PRR=1.04, NS). Not speaking French or English was strongly associated with not obtaining a PSA screen (PRR=0.66, $p \leq 0.01$).

Interpretation: Our finding that Canadian men commonly reported PSA screening for prostate cancer is not congruent with national guidelines. While we wait for randomized controlled trial evidence of the effectiveness of PSA screening in reducing mortality due to prostate cancer, PSA screening has emerged as a public health issue.

MeSH terms: Prostatic neoplasms; prostate-specific antigen; mass screening; cross-sectional studies; practice guidelines

La traduction du résumé se trouve à la fin de l'article.

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Prostate cancer is the most common form of cancer diagnosed in Canadian men, with an estimated 20,700 new cases and 4,200 attributed deaths to occur in 2006.¹ Known non-modifiable risk factors for prostate cancer include: age,² ethnicity^{2,3} and family history^{2,4} of the disease.

The utility of the prostate specific antigen (PSA) blood test for screening for prostate cancer is controversial. In light of the lack of high quality evidence, it has been debated whether the benefits of PSA screening and early detection outweigh the potential health risks and the cost involved.⁵ While PSA testing, together with the digital rectal exam (DRE), has been associated with the detection of early-stage treatable cancers, it has not been shown that screening of asymptomatic men actually reduces mortality from the disease. At the same time, the early diagnosis and treatment of prostate cancers (which in some cases are not aggressive and do not progress significantly during the patient's lifetime) can cause morbidity leading to diminished quality of life (i.e., impotence and incontinence).^{6,7} Furthermore, attempts to increase test sensitivity by conducting investigative biopsies below the traditional PSA threshold of 4.1 ng per milliliter compromises test specificity which may result in unnecessary biopsies and patient anxiety.⁸ Results from two randomized controlled trials assessing the effectiveness of PSA screening are anticipated in 2006 and 2008⁹⁻¹¹ which should help clarify our understanding of the benefits and risks of PSA screening.

The debate over PSA screening for prostate cancer is reflected in the wide variety of PSA screening recommendations issued by medical organizations and agencies worldwide.

Some guideline-issuing organizations, such as the Canadian Task Force on Preventive Health Care, recommend against PSA screening,¹²⁻¹⁸ whereas some organizations, such as the American Cancer Society, recommend screening;¹⁹⁻²¹ still others, such as the United States Preventive Services Task Force, make no recommendation for or against the use of the service, citing insufficient or inconclusive evidence.²²⁻²⁴ While organizations differ in the recommendations they issue regarding PSA screening, many do converge on the provision of a co-recommendation

that shared/informed decision models be used for making screening decisions.^{13,18-23,25} Shared decision-making is a type of informed and joint decision-making in which clinicians initiate the discussion of the risks and benefits of a service with their clients.²⁶

Only a few studies have examined PSA utilization in Canada. A 1995/96 physician medical records audit conducted in Toronto, Ontario, found that 63% of PSA tests performed were for screening purposes.²⁷ A 1996 cross-sectional telephone survey of asymptomatic Alberta men between the ages of 40 and 74 years found that 28.6% (24.6-33.0) had ever received a PSA blood test.²⁸

At the national level in 2000/2001, 43% of Canadian men aged 40 and older reported ever having had a PSA test.²⁹ In the same year, in the United States, 75% of asymptomatic American men aged 50 and older reported ever having a PSA test.³⁰ In the United Kingdom, during the period between 1994 and 1997, nearly one third (36%) of the men aged 50 and older had at least one PSA test.³¹ In none of these national studies, however, was PSA screening discriminated from PSA testing by the reason for which the test was obtained. In Canada, the prevalence of PSA screening remains unknown.

The goal of this study was to inform prostate screening policy by determining the prevalence of PSA screening in Canada and by exploring the socio-demographic characteristics associated with ever having a PSA screening test. Using cross-sectional national survey data, we examined self-reported lifetime and recent PSA screening prevalence patterns by decade of life in the Canadian male population. We also examined lifetime PSA screening prevalence patterns by provincial/territorial region. Furthermore, we assessed lifetime screeners' socio-demographic profiles to identify correlates of PSA screening behaviour.

METHODS

We used data from the 2000/01 Canadian Community Health Survey (CCHS) (cycle 1.1) conducted by Statistics Canada. The CCHS is a cross-sectional, population-based survey designed to study the differences in health among subprovincial units. The CCHS samples approximately 98% of the Canadian population, targeting indi-

Figure 1. PSA screening analyses algorithm

* PCa = prostate cancer

viduals aged 12 or older living in private dwellings and excluding residents of Indian reserves or Crown lands, institutions, some remote areas and full-time members of the Canadian Armed Forces.³²

Study population

In 2001, men aged 40 years and older with no diagnosed prostate cancer were eligible to be asked questions on PSA utilization in the CCHS. The national response rate for the 10 provinces and 3 territories was 84.7%.

PSA screening analyses

Men entered the PSA screening analyses according to the screening algorithm

(Figure 1). Since by definition PSA screening is the PSA testing of asymptomatic men, men who reported having prostate cancer were excluded. PSA testing only for reasons of family history, regular check-up/routine screening or age was considered PSA screening.

We analyzed lifetime screening prevalence by age group (40-49, 50-59, 60-69, 70+). Based on the stratification and clustering of the sample, the CCHS assigns a weight to each respondent to represent his contribution to the population to derive estimates for all prevalence calculations. Variance and 95% confidence intervals were calculated using bootstrap re-sampling

TABLE I

Respondent Characteristics Associated with Lifetime PSA Screening in Canadian Men, 2000/01

Respondent Characteristics	CCHS 2001 Data N (Weighted %)	Prevalence Rate Ratio (PRR)	95% CI
Age			
40-49	10,876 (40.32)		
50-59	7945 (27.88)	2.35*	2.18-2.52
60-69	5539 (17.26)	2.79*	2.59-3.00
70+	5400 (14.53)	2.45*	2.26-2.64
Missing	0		
Family Doctor			
No	4423 (14.53)		
Yes	25,333 (85.47)	1.83*	1.63-2.05
Missing	4 (0.01)		
Income†			
Low			
<\$30,000 if 1-2 persons			
<\$40,000 if 3-4			
<\$60,000 if 5+	9498 (27.10)		
High			
≥\$30,000 if 1-2 persons			
≥\$40,000 if 3-4			
≥\$60,000 if 5+	17,865 (64.56)	1.21*	1.15-1.28
Missing	2397 (8.34)		
Marital Status			
Widowed, separated, divorced, or single	9171 (21.36)		
Married or equivalent	20,558 (78.59)	1.09*	1.03-1.15
Missing	31 (0.06)		
Doctor Visits			
Low (≤2 consults/yr)	16,020 (54.75)		
High (>2 consults/yr)	13,681 (45.07)	1.10*	1.05-1.15
Missing	59 (0.19)		
Country of Birth			
Canada	24,978 (75.51)		
Other	4697 (24.21)	0.90*	0.83-0.96
Missing	85 (0.28)		
Education			
Low (trade certificate, some post secondary, secondary school graduate, grade 11-13, grade 9-10 or ≤grade 8)	21,044 (65.20)		
High (community college or university certificate/degree)	8352 (33.80)	1.06§	1.01-1.12
Missing	364 (1.00)		
Language Spoken			
English or French	29,263 (97.23)		
Not English or French	413 (2.50)	0.66*	0.50-0.86
Missing	84 (0.27)		
Ethnicity‡			
White	27,738 (88.86)		
Aboriginal (North American Indian, Métis or Inuit)	405 (0.62)	0.79	0.58-1.07
Black	140 (1.05)	1.04	0.75-1.45
Asian (Korean, Filipino, Japanese, Chinese, Southeast Asian)	623 (4.36)	0.65*	0.51-0.82
All other	716 (4.68)	0.68*	0.55-0.85
Missing	138 (0.42)		
	0		
Smoking			
Non-smoker (former daily/occasional smoker or non-smoker)	21,468 (73.82)		
Smoker (daily or occasional smoker)	8261 (26.05)	0.82*	0.76-0.87
Missing	31 (0.13)		
Residency Area			
Urban (urban core, urban fringe or area outside census metropolitan area)	20,762 (79.42)		
Rural (rural fringe or urban area outside census metropolitan area)	8998 (20.58)	0.94*	0.89-0.98
Missing	0		

* $p < 0.01$, § $p < 0.05$

† Based on total household income and the number of people living in the household

‡ Self-identification

|| Based on 1996 Census geography

methods to accurately reflect the error from the complex sampling design of the CCHS.³³

The influence of self-reported socio-demographic characteristics on screening behaviour was assessed using binomial regression analyses on prevalence rate ratio (PRR) estimates. PSA screening represents a common outcome, amenable to binomial regression analyses.³⁴ Our model considered the influences of clients' age, education, income, marital status, smoking, having a family doctor, frequency of visits to medical professionals, place of birth, spoken language, ethnicity and urban/rural residency area on obtaining a PSA screening test (Table I). All regression model parametric estimates were bootstrapped to calculate 95% confidence intervals on PRR estimates. Each of the analyses was performed using SAS (Statistical Analyses System) version 8.1 (SAS Institute, North Carolina, U.S.A.) with the SAS statement PROC GENMOD used for the binomial regression.

RESULTS

Overall, the prevalence of lifetime PSA screening in men older than 50 years of age was 47.5% (95% CI=46.4-48.5) (Table II, Figure 2). Seventy-two percent (71.8%) of lifetime screening events were recent (Table II). Lifetime screening prevalence was greatest in the 60-69 year age group (53.1%; 95% CI=51.1-55.1) (Table II). Regionally, for the age groups 50-59 and 60-69 years, lifetime screening prevalences were consistently lower in Alberta (31.3; 95% CI=26.2-36.4 and 39.8; 95% CI=34.0-45.6), Saskatchewan (39.1; 95% CI=32.9-45.3 and 48.4; 95% CI=41.2-55.6) and Manitoba (42.2; 95% CI=35.7-48.6 and 51.3; 95% CI=43.4-59.3) than in the other provinces/territories (Table III).

The binomial regression model allows for the detection of those characteristics and influences that are associated with screening behaviour (Table I).

Lifetime "screeners" were more likely to: be between the ages of 60-69 (PRR=2.79, $p \leq 0.01$), have a family doctor (PRR=1.83, $p \leq 0.01$), have high income (PRR=1.21, $p \leq 0.01$), visit his physician frequently (PRR=1.1, $p \leq 0.01$), be married (PRR=1.09, $p \leq 0.01$), or be highly educated (PRR=1.06, $p \leq 0.05$).

“Non-screeners” were more likely to: not be born in Canada (PRR=0.9, $p \leq 0.01$), have Asian ethnicity (PRR=0.65, $p \leq 0.01$, speak no English or French (PRR=0.66, $p \leq 0.01$), smoke cigarettes (PRR=0.82, $p \leq 0.01$), or live in a rural area (PRR=0.94, $p \leq 0.01$).

Aboriginal or black ethnicity was not predictive of PSA screening behaviour (PRR=0.79, NS; PRR=1.04, NS).

DISCUSSION

Nearly half of Canadian men over the age of 50 (47.5%) reported a lifetime PSA screening event. In the absence of clear, consistent national PSA screening guidelines, evidence of PSA screening in Canada may reflect other determinants such as: men's anxiety over prostate cancer, patients' expectations for PSA, and positive family history of prostate cancer.³⁵ Another possible explanation outside clinical practice for the existence of PSA screening is information from the media.³⁶

Almost three quarters of the men who had received a PSA screening test within their lifetime did so within the last year. This may reflect high attendance to repeat annual screening among those screened, or that the population of newly screened is still growing. A study of PSA workload in Ontario laboratories revealed that the rate of PSA testing (but not screening) increased at a steady rate from 1996 to 2002 and showed no signs of subsiding.³⁷

Similar to the findings from an independent Alberta study,²⁸ we observed screening prevalence to be highest in the 60-69 year age group. This age-related screening pattern may reflect the successful penetration into clinical practice of some guideline recommendations for doctors to discuss screening with men who possess at least a 10-year life expectancy.^{13,20}

The observation that having a family doctor was strongly predictive of screening is supported by a survey of 264 physicians in Ontario showing that PSA screening largely occurred in the family practice setting.²⁷

We observed that reporting a high income was positively related to obtaining a PSA screen. Incomplete insurance coverage patterns for PSA screening in Canada may represent an access issue for some poorer segments of the population who

TABLE II

Lifetime and Recent PSA Screening Prevalence by Age Group and Cumulative Age Group in Canadian Men, 2000/01

Age Group	Sample N	Weighted Population % (95% CI) Lifetime Screening
40-49	10,876	16.8 (15.9-17.8)
50-59	7945	43.4 (41.8-45.0)
60-69	5539	53.1 (51.1-55.1)
≥ 70	5400	48.5 (46.6-50.5)
≥ 50	18,884	47.5 (46.4-48.5)
≥ 40	29,760	35.1 (34.3-35.9)

Age Group	Sample N	Weighted Population % (95% CI) Recent Screening*
40-49	10,873	10.7 (9.9-11.5)
50-59	7942	30.8 (29.2-32.4)
60-69	5536	39.4 (37.6-41.2)
≥ 70	5388	34.1 (32.3-35.9)
≥ 50	18,866	34.1 (33.1-35.1)
≥ 40	29,739	24.7 (23.9-25.4)

Figure 2. Weighted percentage of Canadian men who had a lifetime and/or recent PSA screening test by age decade, 2000/01*

* Error bars represent 95% confidence intervals.

would otherwise decide to be screened. Excepting Saskatchewan, most provinces and territories insure physician-ordered PSA tests under global hospital budgets providing they are for diagnosis and/or surveillance (not screening) of prostate cancer.

The observation that men who did not speak either of Canada's official languages were less likely to obtain a screening test, suggests that language may represent a barrier for men to be screened.

The finding that smokers were less likely to obtain PSA screening is consistent with the results of a population-based study of smoking and prostate cancer risk in which fewer current and heavy smokers reported having had a PSA test than non- or former smokers.³⁸ Furthermore, the literature

describes smokers as less likely to access health services in general.³⁹⁻⁴¹

Our finding that black ethnicity was not associated with obtaining PSA screening suggests that screening, when it does occur, is not being performed in a manner consistent with the high-risk profiles of men or the screening recommendations that some organizations have, specific to black men.^{19,25}

A study strength is our operational definition of PSA screening of asymptomatic men. In our attempt to exclude PSA testing of symptomatic men, we excluded all men with diagnosed prostate cancer and men who reported diagnostic/treatment-related reasons for testing such as follow-up of a previous problem or follow-up for treatment of prostate cancer.

TABLE III

Lifetime PSA Screening in the 10 Canadian Provinces and 3 Territories by Age Decade, 2000/01*

Age	Sample N (Weighted %)										
	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	TR*
40-49	309 (12.9)	273 (17.5)	406 (20.0)	412 (24.3)	1939 (14.2)	3200 (18.1)	720 (19.3)	593 (13.5)	1305 (14.6)	1495 (18.4)	224 (16.5)
50-59	286 (45.0)	264 (41.5)	331 (43.1)	316 (48.2)	1480 (44.0)	2379 (46.3)	415 (42.2)	436 (39.1)	808 (31.3)	1103 (42.2)	127 (25.6)
60-69	155 (42.0)	163 (59.4)	210 (58.4)	227 (54.9)	995 (51.0)	1746 (57.4)	338 (51.3)	320 (48.4)	548 (39.8)	783 (55.5)	54 (28.7)
≥70	142 (43.1)	160 (44.6)	261 (44.5)	172 (48.1)	825 (48.9)	1737 (51.4)	405 (47.0)	406 (38.9)	513 (40.4)	746 (50.2)	33 (20.0)

*TR = Yukon, Northwest Territories and Nunavut combined

Data from the CCHS are self-reported and should be interpreted with caution. Self-reported data in general may be inaccurate because people may not remember receipt of, date of, or reason for testing. Furthermore, over-reporting for some cancer tests has been reported in the literature,⁴² which may suggest our overestimation of prevalence rates. However, while we did not independently verify with medical records if respondents who reported ever having a PSA screen actually did, another study which compared self-report versus medical records audits for prostate testing found these rates to be similar.⁴² Inaccuracy related to respondents' reasons for PSA testing makes it difficult to distinguish screening from testing, and as such this error may be propagated in our operational definition of screening. Men's knowledge and awareness of the screening test may additionally complicate accurate assessment of self-reported PSA data.^{28,36}

One final limitation of our work is that for lifetime screening, some respondents' characteristics must be interpreted in the light of the lack of time sequence information. For example, age and marital status might have been different at the time the actual screening test was taken.

Our results show that clinical practice of PSA screening is not congruent with national screening guidelines and recommendations. Given the high volume of screening we found – though PSA screening tests are mostly uninsured – the cascade of events following a positive test (diagnosis, treatment and follow-up) are insured. In this manner, PSA screening for prostate cancer can greatly impact the health care system. That it has is evidenced by the large increase in screen-detected prostate cancer cases since the 1990s.⁴³ Since these numbers are so large, so is the demand for access to good evidence-based care for those men who are diagnosed. The health system can no longer argue that the only reasonable attitude towards PSA

screening for prostate cancer is to wait for more evidence of its effectiveness. Our data suggest that PSA screening for prostate cancer is already a public health issue.

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RÉSUMÉ

Contexte : Bien que les lignes directrices nationales ne recommandent pas le dépistage de l'antigène prostatique spécifique (PSA) pour le cancer de la prostate, ou jugent que ce dépistage est peu concluant, il est possible que les hommes canadiens subissent quand même ce test de dépistage.

Méthode : Pour améliorer la politique sur le dépistage du cancer de la prostate, nous avons analysé les données transversales autodéclarées tirées de l'Enquête sur la santé dans les collectivités canadiennes (2000-2001) afin de déterminer la prévalence du test PSA, récemment et au cours de la vie, chez les hommes canadiens de 50 ans et plus n'ayant pas de cancer de la prostate. Nous voulions aussi analyser les caractéristiques sociodémographiques associées au fait d'avoir subi ce test à un moment ou à un autre. Au moyen d'analyses de régression multivariée binomiales, nous avons calculé le rapport des taux de prévalence (RTP) pour mesurer les liens entre les caractéristiques des répondants et leur schéma d'utilisation du test PSA.

Résultats : Près de la moitié des hommes canadiens de plus de 50 ans (47,5 %; IC de 95 % = 46,4-48,5) ont dit avoir subi le test PSA au cours de leur vie. Soixante-douze p. cent (71,8 %) des tests PSA avaient été administrés moins d'un an avant l'enquête, ou récemment. La prévalence de ce test au cours de la vie était la plus élevée chez les hommes de 60 à 69 ans (53,1 %; IC de 95 % = 51,1-55,1). Après l'âge avancé, le fait d'avoir un médecin de famille était le prédicteur le plus important de l'utilisation du test (RTP = 1,83, $p \leq 0,01$). Le fait d'être Noir, qui est un facteur de risque pour le cancer de la prostate, n'était toutefois pas une variable prédictive de l'utilisation du test (RTP = 1,04, aucun écart statistique). Le fait de ne parler ni français, ni anglais était fortement associé à la non-utilisation du test PSA (RTP = 0,66, $p \leq 0,01$).

Interprétation : Nous avons constaté que les hommes canadiens déclarent communément avoir subi un test PSA pour le dépistage du cancer de la prostate, ce qui ne concorde pas avec les lignes directrices nationales. En attendant que des études randomisées et contrôlées prouvent l'efficacité du test PSA pour réduire la mortalité due au cancer de la prostate, ce test commence à être vu comme un problème de santé publique.

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